Ontario eSecondary School
Course Outline
2024-2025

Ministry of Education Course Title: Science, Grade 12, University/College Preparation	
Ministry Course Code: SNC4M	
Course Type: University/College	
Grade: 12	
Credit Value: 1.0	
Prerequisite(s): Grade 10 Science, Academic or any Grade 11 university (U), university/college (M), or college (C) preparation course in the science curriculum.	
Department: Science	
Course developed by: **Kiran Sandhar**	**Date: February 1, 2021**
Length: **One Semester**	**Hours:** **110**

This course has been developed based on the following Ministry documents:

1. *The Ontario Curriculum, Grades 11 and 12: Science, 2008*
2. *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools (2010)*
3. *Learning for All (2013)*

COURSE DESCRIPTION/RATIONALE

This course enables students, including those who do not intend to pursue science-related programs at the postsecondary level, to further develop their understanding of science and its technological applications. Students will explore a range of topics, including organic products in everyday life; pathogens and disease; energy alternatives and their impact globally; communications systems; and science and contemporary societal issues. Emphasis will be placed on relating these topics to global issues as well as to daily life, and on developing skills in the areas of experimentation, research, critical thinking, and analysis

OVERALL CURRICULUM EXPECTATIONS

Unit 1: Medical Technologies
By the end of this course, students will:

- assess the impact of medical technologies and therapies, both conventional and alternative, used to diagnose and treat human health conditions;
- investigate the uses of, and analyse the information provided by, a variety of medical technologies;
- demonstrate an understanding of the function and use of a variety of medical technologies and the information they provide about the human body.

Unit 2: Pathogens and Disease
By the end of this course, students will:

- evaluate the impact of scientific and technological knowledge and individual behaviour on the control of pathogens and the prevention of disease;
- investigate the nature and growth of pathogens and the effectiveness of measures intended to prevent their spread;
- demonstrate an understanding of pathogens, the diseases they cause, and ways of controlling their spread

Unit 3: Nutritional Science
By the end of this course, students will:

- assess how personal and societal factors affect eating behaviours, and evaluate the social and economic impact of the use of non-nutrient food additives;
- investigate chemical components of and energy in food, and the processes by which food is digested
- demonstrate an understanding of chemical components of and energy in food, and the processes by which food is digested.

Unit 4: Science and Public Health
By the end of this course, students will:

- assess the impact of scientific research, technological advances, and government initiatives on public health;
- investigate various strategies related to contemporary public health issues;
- demonstrate an understanding of major public health issues, past and present

Unit 5: Biotechnology

By the end of this course, students will:

- analyse a variety of social, ethical, and legal issues related to applications of biotechnology in the health, agricultural, or environmental sector;
- investigate various techniques used in biotechnology and how they are applied in the food industry and the health and agricultural sectors;
- demonstrate an understanding of biological processes related to biotechnology and of applications of biotechnology in the health, agricultural, and environmental sectors.

COURSE CONTENT

Unit	*Length*
Unit 1: Medical Technology	17 hours
Unit 2: Pathogens and Disease	26 hours
Unit 3: Nutritional Science	16 hours
Unit 4: Science and Public Health	21 hours
Unit 5: Biotechnology	18 hours
Unit 6: Culminating Project and Final Exam	12 hours
	Total 110

UNIT DESCRIPTIONS

UNIT 1: MEDICAL TECHNOLOGY

In this unit, students will explore the positive and negative effects of Medical Technologies can have on society, human health, the economy, and the environment. They will understand the use medical technologies, and the science behind them, can help patients better understand their diagnoses and treatment options

UNIT 2: PATHOGENS AND DISEASE

In this unit, students will explore appropriate technologies and making informed choices with respect to personal behaviour can limit the spread of pathogens and diseases. They will also be exposed to methods used to control the spread of pathogens and diseases can have both positive and negative effects on human health.

UNIT 3: NUTRITIONAL SCIENCE

In this unit, students will explore the nutrients and other substances found in foods affect human health and well-being. They will gain an understanding of the role of nutrients and other substances found in foods enables people to make healthy lifestyle choices

UNIT 4: SCIENCE AND PUBLIC HEALTH

In this unit, students will gain an understanding of threats to public health and help individuals and societies adopt appropriate practices to protect their health and the health of others. They will also explore a global approach to public health that is necessary to help prevent future pandemics.

UNIT 5: BIOTECHNOLOGY

In this unit, students explore many social, ethical, and legal issues and conflicting interests have to be considered when determining the appropriate uses of biotechnology. They will understand that scientific knowledge helps individuals and society make informed decisions regarding biotechnology.

TEACHING AND LEARNING STRATEGIES

In this course, students will experience the following activities.

Presentations with embedded videos are utilized to outline concepts, explain theory with the use of examples and practice questions, and incorporate multi-media opportunities for students to learn more (e.g. online simulations, quizzes, etc.).

End of unit conversations and Poodlls are opportunities for students to express their ideas, problem solving, and thought processes with a teacher who provides timely feedback.

Reflection is an opportunity for students to look back at concepts and theories with new eyes, to relate theory to practice, and to align learning with their own values and beliefs.

Discussions with the instructor are facilitated through video conferencing, discussing the concepts and skills being studied. This enables two-way communication between the student and the instructor, to share ideas and ask questions in dialogue. This also helps to build a relationship between the student and instructor.

Instructor demonstrations (research skills, etc.) are opportunities for the instructor to lead a student through a concept or skill through video conferencing, videos, or emailing with the student.

Practical extension and application of knowledge are integrated throughout the course. The goal is to help students make connections between what they learn in the classroom and how they understand and relate to the world around them and their own lives. Learning becomes a dynamic opportunity for students to be more aware that their learning is all around them and enable them to create more meaning in their lives.

Individual activities/assignments assessments are completed individually at a student's own pace and are intended to expand and consolidate the learning in each lesson. Individual activities allow the teacher to accommodate interests and needs and to assess the progress of individual students. For this reason, students are encouraged to discuss IEPs (Individual Education Plans) with their teacher and to ask to modify assessments if they have a unique interest that they feel could be pursued in the assessment. The teacher plays an important role in supporting these activities by providing ongoing feedback to students, both orally and in writing.

Research is an opportunity to apply inquiry skills to a practical problem or question. Students perform research to gather information, evaluate quality sources, analyze findings, evaluate their analysis, and synthesize their findings into conclusions. Throughout, students apply both creative thinking and critical thinking. New questions are also developed to further learning.

Writing as a learning tool helps students to think critically about course material while grasping, organizing, and integrating prior knowledge with new concepts. Good communication skills are important both in and out of the classroom.

Virtual simulations are interactive websites that provide students with an opportunity to ask questions, explore hypotheses, relate variables, examine relationships, and make connections between theory and application in a safe environment that promotes intellectual risk taking and curiosity.

Virtual labs are interactive websites that provide students with an opportunity to follow a procedure to test hypotheses using scientific apparatus, gather and record observations, analyze observations using formula and relevant theory/concepts, and then formulate conclusions that relate hypotheses to analysis.

Diagrams are visual representations of scientific ideas and concepts. They provide another perspective to organize ideas. Visuals are thought to promote cognitive plasticity - meaning, they can help us change our minds or help us to remember an idea.

Graphics/images are visual representations of ideas/concepts. Visuals are thought to promote cognitive plasticity - meaning, they can help us change our minds or help us to remember an idea.

Charts are visual representations of scientific ideas and concepts using math that support analysis. For example, you can have a pie chart that shows Canada's energy sources.

Tables involve organizing information in terms of categories (rows and columns). This helps us to understand the relationships between ideas and data, as well as highlight trends.

Drawings and schematics are scientific and engineering ideas explained visually. For example, an electric circuit can be explained using symbols, which makes it possible to communicate ideas universally, clearly, and succinctly.

Articles are examples of concepts and theories being discussed in the public realm and with respect to current events. They are snapshots not only of why scientific theories/concepts/applications are relevant but also provide a window into the broader context of scientific knowledge and understanding. Students learn through reading and analysis that science is deeply related to, and intertwined with, society and the diverse perspectives of lived experience.

Practice problems provide students with a scenario/problem to solve by applying concepts and skills learned in a context. This helps students to understand the relevance of their learning.

ASSESSMENT, EVALUATION, AND REPORTING

Assessment: The process of gathering information that accurately reflects how well a student is achieving the identified curriculum expectations. Teachers provide students with descriptive feedback that guides their efforts towards improved performance.

Evaluation: Assessment of Learning focuses on Evaluation which is the process of making a judgement about the quality of student work on the basis of established criteria over a limited, reasonable period of time.

Reporting: Involves communicating student achievement of the curriculum expectations and Learning Skills and Work Habits in the form of marks and comments as determined by the teacher's use of professional judgement.

STRATEGIES FOR ASSESSMENT

Assessment practices can nurture students' sense of progress and competency and information instruction. Many diagnostic tools, e.g. checklists and inventories, are used at regular intervals throughout the units to encourage students' understanding of their current status as learners and to provide frequent and timely reviews of their progress. Assessment of student acquisition of listening and talking, reading and viewing and writing skills also occurs regularly through unobtrusive teacher observation and conferencing.

Units conclude with performance tasks, e.g. interview, test, etc. Teachers are encouraged to share goals with students early in the course and to connect unit learning experiences frequently and explicitly with big ideas, overall expectations, and performance tasks. The teacher is encouraged to involve students in the discussion, modification, or creation of rubrics, and teach students to use rubrics as a learning tool.

ASSESSMENT ACTIVITIES

- ❑ Homework assignments
- ❑ Individual conference meetings

- ❑ Diagnostic tests and writing tasks
- ❑ Completed Templates & Graphic Organizers
- ❑ Reflections
- ❑ Oral presentations & Active Listening
- ❑ Evaluations
- ❑ Lab Reports

EVALUATION

The final grade will be determined as follows:

- ❑ Seventy percent of the grade will be based on evaluation conducted throughout the course. This portion of the grade should reflect the student's most consistent level of achievement throughout the course, although special consideration will be given to more recent evidence of achievement.
- ❑ Thirty percent of the grade will be based on a final evaluation administered at or towards the end of the course. This evaluation will be based on evidence from one or a combination of the following: an examination, a performance, an essay, and/or another method of evaluation suitable to the course content. The final evaluation allows the student an opportunity to demonstrate comprehensive achievement of the overall expectations for the course.

  (*Growing Success: Assessment, Evaluation and Reporting in Ontario Schools*. Ontario Ministry of Education Publication, 2010 p.41)

	Weight
Course Work	**70**
Knowledge/Understanding (K)	17.5
Thinking/Inquiry (T)	17.5
Communication (C)	17.5
Application (A)	17.5
Final	**30**
Exam (7.8K, 4.2T, 4.2C, 3.8A)	20
Culminating Project (1K, 2T, 3C, 4A)	10

TERM WORK EVALUATIONS (70%)

Evaluation Item	Description	Category	Weight
Unit 1 Health Care Devices Project	Students will evaluate different healthcare devices for their purpose and use.	K, T, C, A	14
Unit 1 Medical Technology Test	Students will demonstrate their learning for unit 1.	K, T, C, A	
Unit 2 Public Health Video	Students will investigate Public Health and their role in preventing disease.	K, T, C, A	17
Unit Pathogens Unit Test	Students will demonstrate their learning for unit 2.	K, T, C, A	
Unit 3 Unit 1-3 Interview	Students will meet with their teacher to answer questions about their learning in the course thus far.	K, T, C, A	8
Unit 3 Fad Diet Article	Students will learn about food behaviours and the harms of fad diets. They will consolidate this learning in a writing activity.	K, T, C, A	
Unit 4 Mental Health and Smoking Campaign	Students will apply their knowledge of unit concepts and create an anti-smoking campaign and mental health supprots.	K, T, C, A	19
Unit 4 Action Plan	Students will apply what they have learned about tuberculosis and its impact on Canadian First Nations.	K, T, C, A	
Unit 4 Unit 4-5 Interview	Students will meet with their teacher to answer questions about their learning in units 4 and 5.	K, T, C, A	
Unit 5 Biotechnology Unit Test	Students will demonstrate their learning for unit 5.	K, T, C, A	12

FINAL EVALUATIONS (30%)

Evaluation Item	Description	Category	Weight
Final Project	Students will consolidate what they have learned in the course into a creative public health article.	K, T, C, A	10
Final Exam		K, T, C, A	20

AFL/AAL/AOL TRACKING SHEET

Unit 1: Medical Technology

AAL	AFL	AOL
1.1 Vital Signs **1.2 Homeostasis and Hyperthermia** **1.5 Organ Donation Opt In vs Opt Out** **1.7 Prosthetics**	**1.2 Diabetes and Obesity** **1.3 Decoding Cancer** **1.4 Investigating Blood Virtual Lab**	**1.6 Evaluating Health Care Devices** **1.9 Medical Technology Unit Test**

1.8 FNMI Medicine vs Western Medicine **1.9 End of Unit Interview**		

Unit 2: Pathogens and Disease

AAL	AFL	AOL
2.2 Virus Lytic Cycle Gizmo **2.3 Gram Stains Virtual Lab** **2.6 Who Gets The Drug? Ethical Dilemma**	**2.1 Epidemics, Pandemics, Outbreaks** **2.3 Virus vs Bacteria Webquest** **2.4 Primary and Secondary Immune Response** **2.5 Controlling Bacterial Growth Virtual Lab** **2.7 Social Media Campaign for Personal Hygiene Practices**	**2.8 Organizations that Support and Promote Public Health Video** **2.9 Pathogens Unit Test**

Unit 3: Nutritional Science

AAL	AFL	AOL
3.1 Macromolecules AAL **3.4 Additive Investigation AAL**	**3.2 Digestive System and Enzymes** **3.3 Nutrient Labelling Assignment**	**Unit 1-3 Interview** **3.5 Fad Diet Article Assignment**

Unit 4: Science and Public Health

AAL	AFL	AOL
4.2 Public Health Media Analysis **4.4 Substance Abuse Case Study** **4.5 Climate Change Impact**	**4.1 History of Vaccines** **4.3 Travel Brochure Assignment**	**4.6 Mental Health and Anti Smoking Campaign Analysis** **4.7 Tuberculosis First Nations Action Plan**

Unit 5: Biotechnology

AAL	AFL	AOL
5.1 Genetic Science Ethics **5.2 RNA Protein Synthesis** **5.4 Viruses as Vectors** **5.5 DNA Fingerprinting and Gel Electrophoresis** **5.6 GMos**	**5.2 Transcription vs Translation** **5.3 Restriction Enzyme AFL** **5.7 Genome Editing and CRISPR**	**Unit 4-5 Interview** **5.8 Biotechnology Unit Test**

End of Course: Final Tasks

AOL (30% of Final Mark)
Culminating Activity (10%): National Geographic Magazine
Final Exam (20%)

CONSIDERATION FOR PROGRAM PLANNING

PLANNING PROGRAMS FOR STUDENTS WITH SPECIAL EDUCATION NEEDS

Classroom teachers are the key educators of students who have special education needs. They have a responsibility to help all students learn, and they work collaboratively with special education teachers, where appropriate, to achieve this goal. Special Education Transformation: The Report of the Co-Chairs with the Recommendations of the Working Table on Special Education, 2006 endorses a set of beliefs that should guide program planning for students with special education needs in all disciplines. Those beliefs are as follows: All students can succeed. Universal design and differentiated instruction are effective and interconnected means of meeting the learning or productivity needs of any group of students. Successful instructional practices are founded on evidence-based research, tempered by experience.

PROGRAM CONSIDERATIONS FOR ENGLISH LANGUAGE LEARNERS

Ontario schools have some of the most multilingual student populations in the world. The first language of approximately 20 percent of the students in Ontario's English language schools is a language other than English. Ontario's linguistic heritage includes several Aboriginal languages; many African, Asian, and European languages; and some varieties of English, such as Jamaican Creole. Many English language learners were born in Canada and raised in families and communities in which languages other than English were spoken, or in which the variety of English spoken differed significantly from the English of Ontario classrooms. Other English language learners arrive in Ontario as newcomers from other countries; they may have experience of highly sophisticated educational systems, or they may have come from regions where access to formal schooling was limited. When they start school in Ontario, many of these students are entering a new linguistic and cultural environment.

THE ROLE OF TECHNOLOGY IN THE PROGRAM

Information and communications technologies (ICT) provide a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' language learning. ICT tools include multimedia resources, databases, Internet websites, digital cameras, and word-processing programs. Tools such as these can help students to collect, organize, and sort the data they gather and to write, edit, and present reports on their findings. Information and communications technologies can also be used to connect students to other schools, at home and abroad, and to bring the global community into the local classroom. Whenever appropriate, therefore, students should be encouraged to use ICT to support and communicate their learning.

ACCOMMODATIONS

Accommodations will be based on meeting with parents, teachers, administration and external educational assessment reports. The following three types of accommodations may be provided:

- ***Instructional accommodations:*** such as changes in teaching strategies, including styles of presentation, methods of organization, or use of technology and multimedia.
- ***Environmental accommodations:*** such as preferential seating or special lighting.
- ***Assessment accommodations:*** such as allowing additional time to complete tests or assignments or permitting oral responses to test questions.

Other examples of modifications and aids, which may be used in this course, are:

- Provide step-by-step instructions.
- Help students create organizers for planning writing tasks.
- Record key words on the board or overhead when students are expected to make their own notes.
- Allow students to report verbally to a scribe (teacher/ student) who can help in note taking.
- Permit students a range of options for reading and writing tasks.
- Where an activity requires reading, provide it in advance.
- Provide opportunities for enrichment.